

**TAMROCK USA INC.**  
**POWER SYSTEM CHECK LIST**

FOR  
Safety Component System with a  
Caterpillar 3304NA engine.

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MSHA CERTIFICATION 31D110, 31D111

**MACHINE APPVLS: 31-117, -120, -121, -124, -126, -132, -137**

Items and functions used in this document must be maintained in order for the Safety Component System to be considered permissible. For a complete vehicle permissibility evaluation, this checklist must be used in conjunction with a vehicle permissibility checklist and, if so equipped, an electrical system checklist.

(WEEKLY) WHERE SHOWN ON THE FOLLOWING PAGES DESIGNATES THOSE  
INSPECTION CHECKS THAT MUST BE PERFORMED DURING THE WEEKLY  
MAINTENANCE EXAMINATION IN ACCORDANCE WITH 30 CFR SECTION  
75.1914.

**ALL INSPECTIONS AND TESTS SHALL BE PERFORMED IN FRESH AIR**

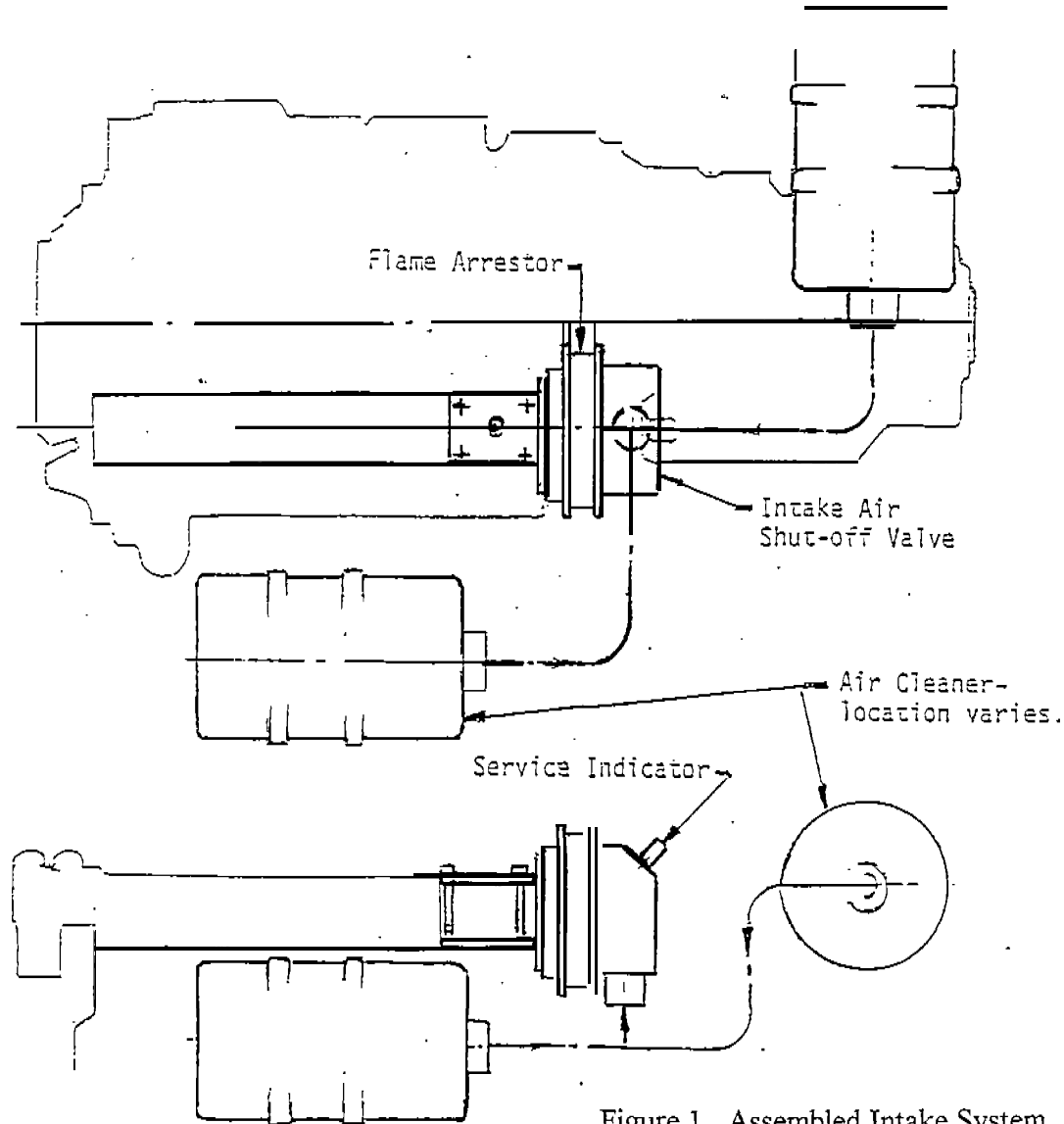
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1. ( ) It has been determined that the area in which the tests are to be performed is fresh air.
2. ( ) This machine utilizes a Caterpillar four cylinder Model 3304 PCNA diesel engine.

### **INTAKE SYSTEM**

Figure 1 shows the assembled intake system.

- (WEEKLY) 3. ( ) All components appear to be the same as one of the diagrams shown in Figure 1.



**Figure 1. Assembled Intake System**

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- (WEEKLY) 4. ( ) A copper gasket is installed between the air intake adapter and the engine as shown in Figure. 2.

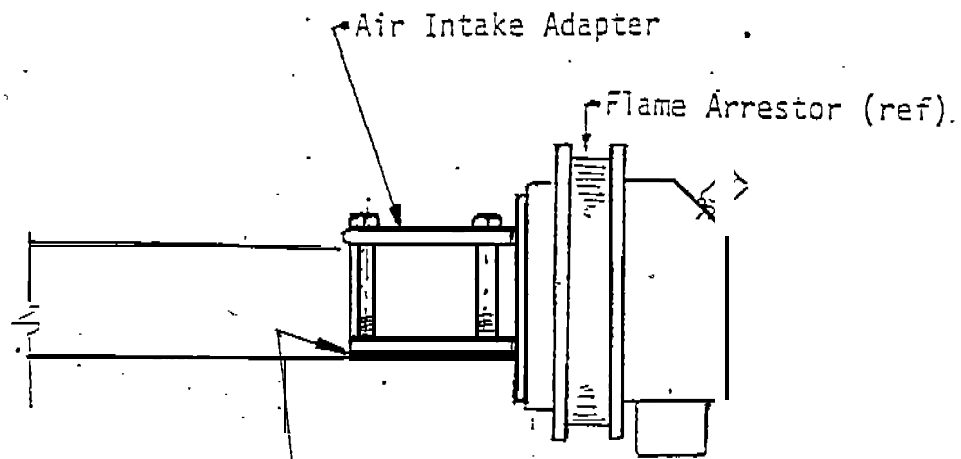


Figure 2. Gasket between Air Intake Adapter and Intake Manifold.

- (WEEKLY) 5. ( ) The fasteners securing the air intake adapter to the engine are in place and tight.

6. ( ) Remove the intake flame arrester. The intake flame arrester is shown in Figure 3. The flame arrester core is clean and has no apparent damage.

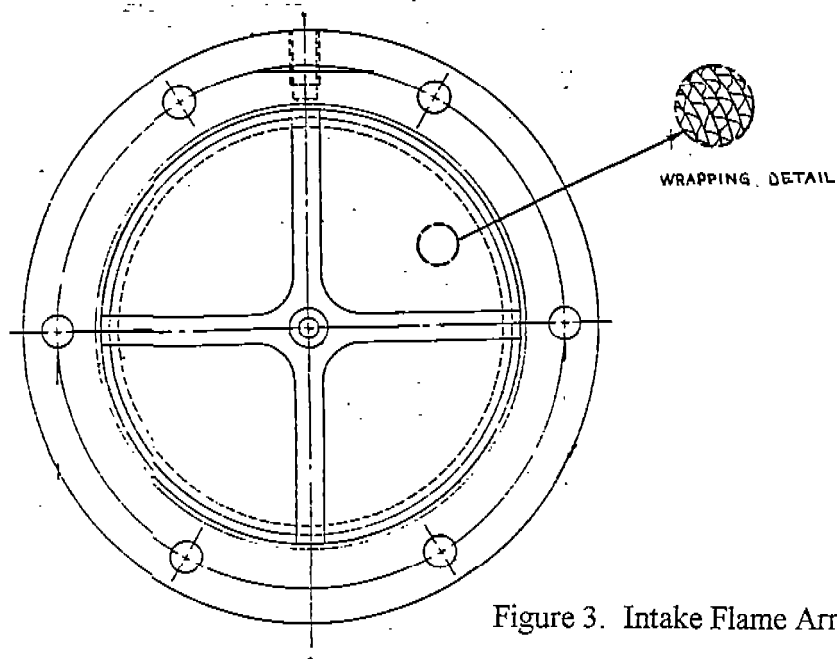


Figure 3. Intake Flame Arrester

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7. ( ) A 0.018 inch wire gauge cannot pass through the openings of the flame arrester-core. The procedure for making this inspection (dated August 5, 1985) is attached. Also see figure 4.

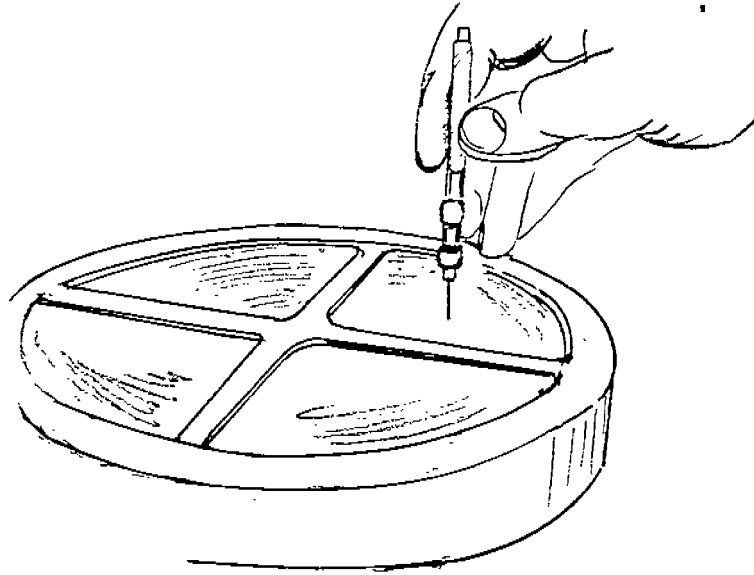


Figure 4.

- (WEEKLY) 8. ( ) A copper gasket is installed between the intake flame arrester and the air intake adapter as shown in Figure 6.

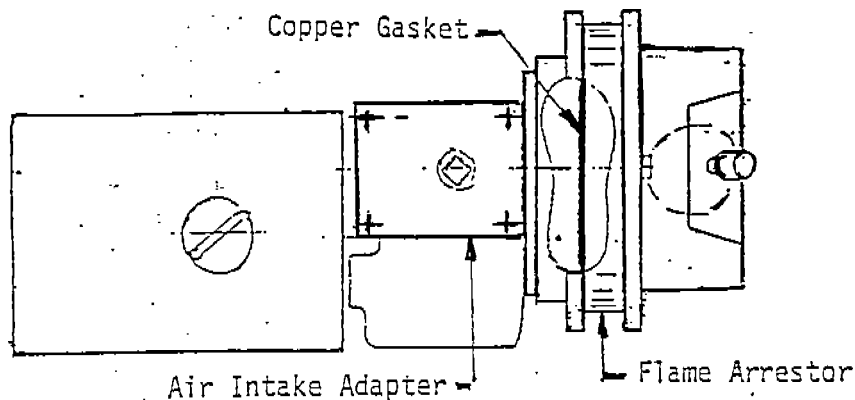


Figure 6. Flame Arrester Gasket

- (WEEKLY) 9. ( ) The fasteners securing the intake air shut-off housing and flame arrester to the air intake adapter are in place and tight.
- (WEEKLY) 10. ( ) The complete intake system has no signs of damage. There are no loose connections, cracks, or missing port plugs (or caps).

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EVALUATION PROCEDURES FOR INSPECTING CRIMPED-RIBBON TYPE  
INTAKE FLAME ARRESTERS ON DIESEL-POWERED EQUIPMENT  
(AUGUST 5, 1985)

1. Remove flame arrester assembly from housing.
2. Place on flat surface with a contrasting background under the flame arrester such as, brattice cloth or a clean white cloth.
3. Adequate lighting is required; cap lamp lighting is not Sufficient”
4. Visually inspect each side of flame arrester for openings or spaces, obviously greater than the triangular spaces of the core. These kinds of openings may have been caused by prying a screwdriver or other such objects against or through the flame arrester core during manufacturing or in mine maintenance. Flame arrester cores with such damage must not be permitted to be used on permissible equipment.
5. Visually inspect each side of the core for places where the windings of the flame arrester core appear to be separating such that gaps can be seen- If such gaps exist they must be checked as follow-s:
  - a. The only measuring tool considered acceptable for performing this evaluation is an 0.018 iron calibrated plug gauge. (Sometimes called a w-ire gauge.) The Plug guage is to be mounted in a gauge holder (Figure 5) weighing 1 to 1.5 ounce and projecting at least one inch out of the end.



Figure 5

- b. Grasp the gauge holder lightly between the index finger and thumb. Place the wire tip at the point in question; making sure the plug gauge is vertical. Using only the weight of the gauge and holder, see if it will enter the apparent gap. Do not attempt to force or wiggle the gauge through the opening.
  - c. If the plug gauge enters the opening, the flame arrester core must not be used on permissible equipment.

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6. Visually inspect the triangles in the flame arrester core (both sides) for triangles that appear to be larger than the rest. If such conditions exist, these openings must be checked as previously described in Section 5 a, b, c.
7. Finally, if the flame arrester core passes all of the above evaluations, a final check should be performed on at least 5 triangles on each side of the core with the procedure described in Section 5 a,b,c. In performing this check the tip of the plug gauge must be placed against a specific triangular opening. If this special care is not taken, the evaluation will be invalid.

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## EXHAUST SYSTEM

The exhaust system of the engine includes a water-cooled exhaust manifold, exhaust pipe, a waterbath exhaust conditioner and a make up water tank.

- (WEEKLY) 11. ( ) The fasteners securing the exhaust manifold to the engine are in place and tight. The water-cooled exhaust manifold is illustrated in Figure 7.

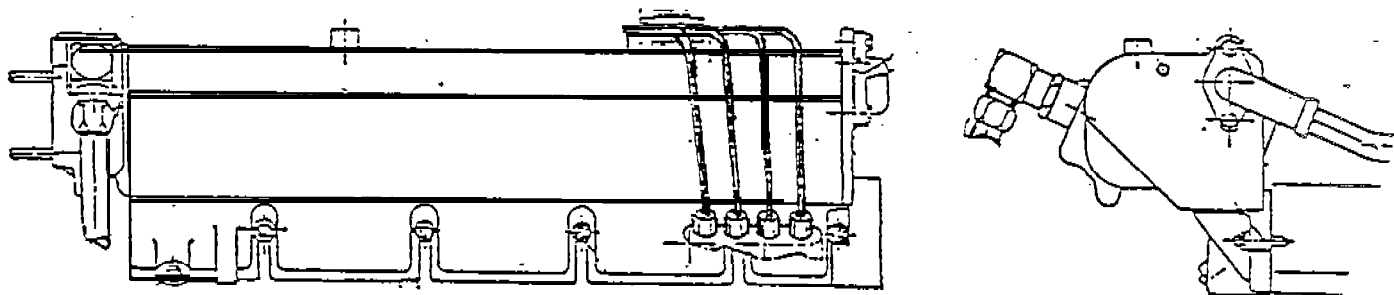


Figure 7. Water-Cooled Exhaust Manifold

- (WEEKLY) 12. ( ) A steel gasket (2 pieces) is installed between the exhaust manifold and the engine head as shown in Figure 8.

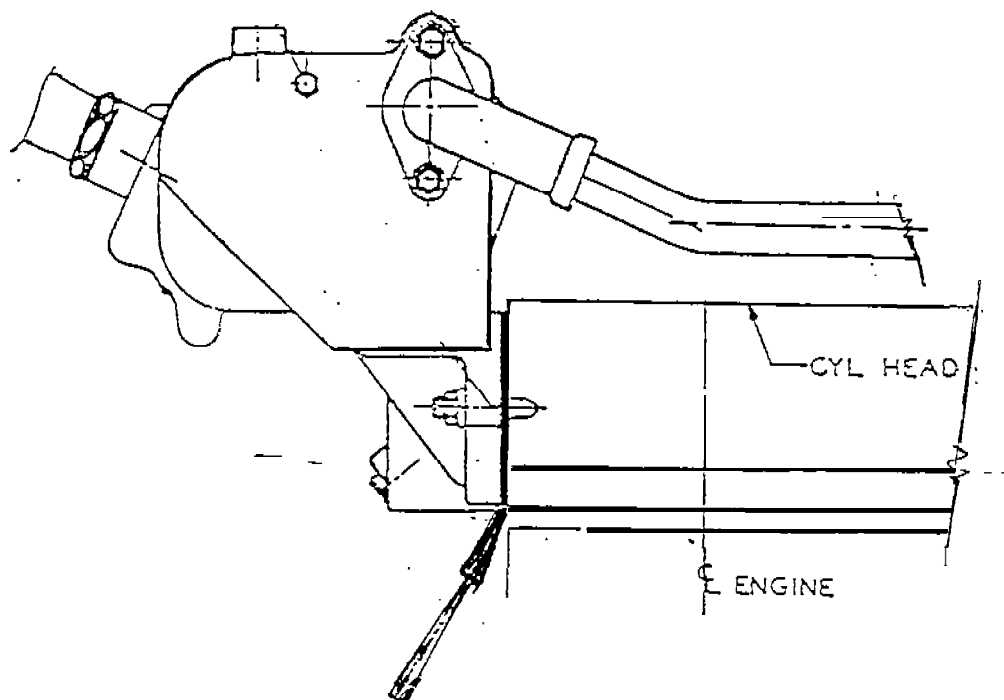


Figure 8. Gasket Between Exhaust Manifold and Engine

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- (WEEKLY) 13. ( ) A copper or bronze gasket is installed between the flange of the exhaust pipe and the flange of the exhaust manifold as shown in Figure 9.

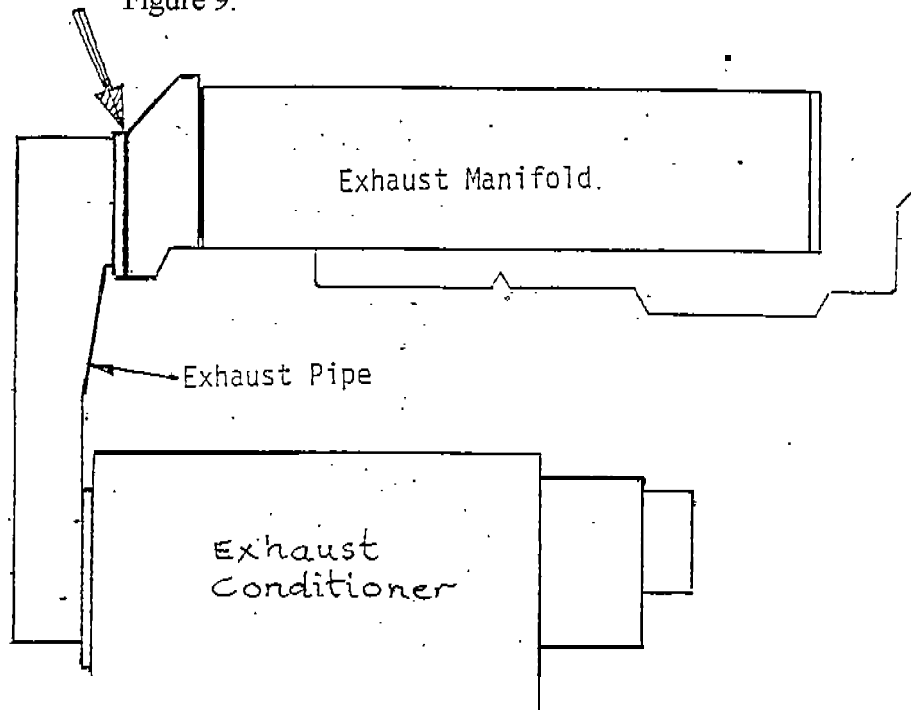


Figure 9, Gasket between Exhaust Pipe and Exhaust Manifold Flange

- (WEEKLY) 14. ( ) Fasteners securing the exhaust pipe to the flange of the exhaust manifold are in place and tight.

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- (WEEKLY) 15. ( ) A bronze gasket is installed between the flange of the exhaust pipe and the flange of the exhaust conditioner as shown in Figure 10.

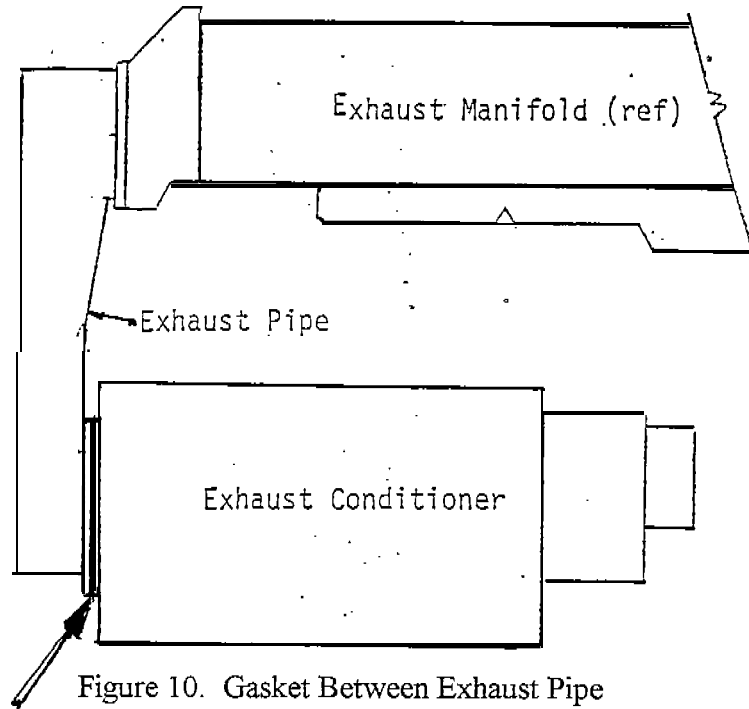


Figure 10. Gasket Between Exhaust Pipe  
And the Flange of the Exhaust Conditioner

- (WEEKLY) 16. ( ) Fasteners securing the exhaust pipe to the flange of the exhaust conditioner are in place and tight.
17. ( ) Remove Exhaust conditioner cover.

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18. ( ) A bronze gasket is installed between the flange of the exhaust conditioner and the flange of the scrubber insert as shown in Figure 11.

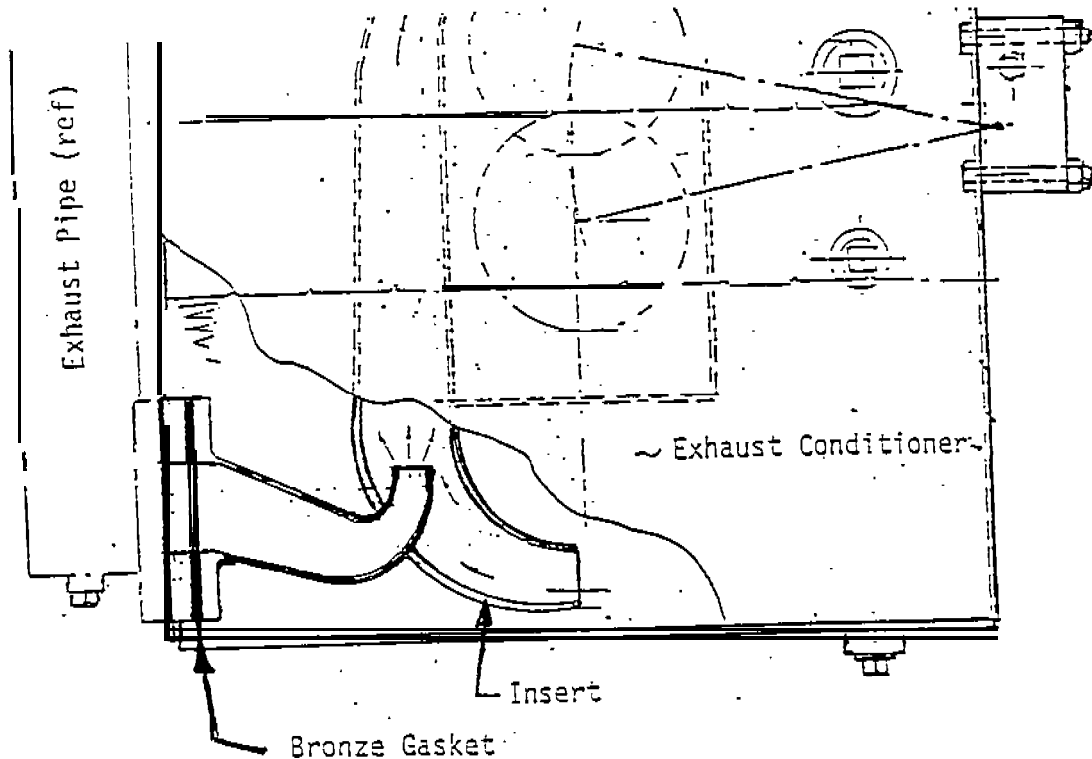


Figure 11. Gasket Between Exhaust Conditioner Flange and Scrubber Insert Flange.

19. ( ) Replace exhaust conditioner cover. AU fasteners securing the cover are in place and tight.
- (WEEKLY) 20. ( ) The exhaust conditioner is in good condition with no open holes or cracks due to corrosion, accidents, missing plugs, etc.

### **SYSTEM OPERATION**

- (WEEKLY) 21. ( ) The engine shuts down when the "push to stop engine" button is held in. This stop button is located in the instrument panel in the operator's compartment.

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22. ( ) Connect a manometer or magnehelic (vacuum gauge) to the intake vacuum port shown in Figure 13. Run the engine at full throttle with no load. The intake vacuum does not exceed 30 inches of water column.

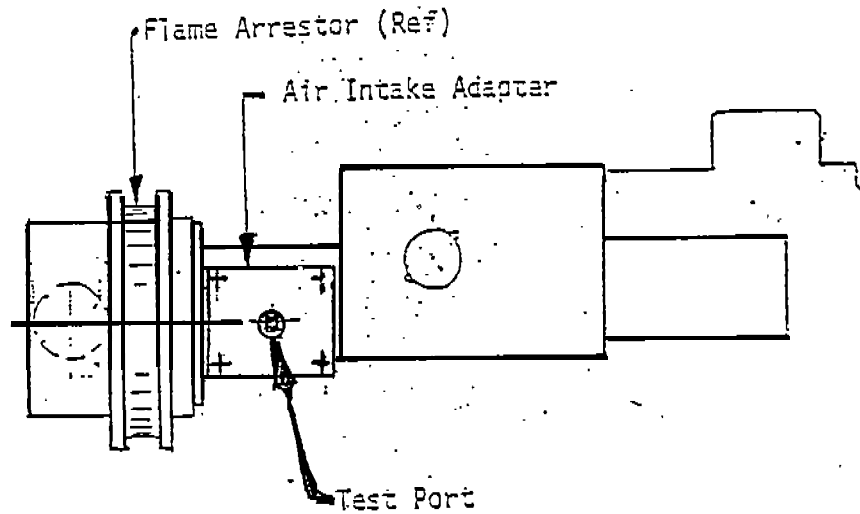


Figure 13. Intake Vacuum Port Location

23. ( ) Remove the manometer or magnehelic and securely reinstall the vacuum port plug.

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24. ( ) Connect a manometer or magnehelic to the test port in the exhaust pipe flange shown in Figure 14. Run the engine at full throttle no load, with exhaust conditioner filled to normal operating water level. The exhaust backpressure does not exceed 34 inches of water.

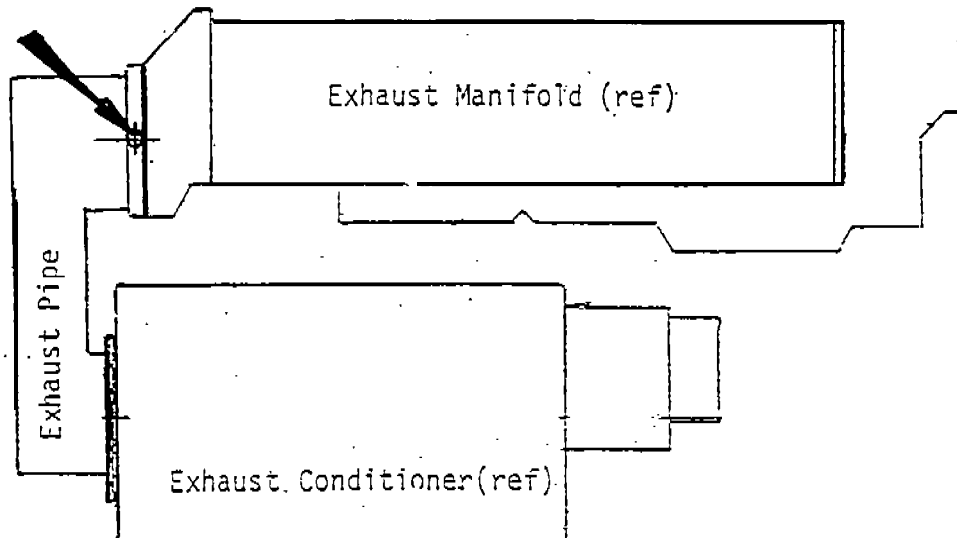


Figure 14. Location of Exhaust System Back Pressure Test Port

25. ( ) Shut engine down and remove manometer or magnehelic and securely reinstall test plug.
- (WEEKLY) 26. ( ) With engine running, check the air system for leaks (i.e., hose connections, sensors, air tanks, air tank drain valves, filters, control valves, float valves, etc.) No leaks were found.
27. ( ) The Safety/Cooling Systems include two temperature sensors. One is placed in the coolant discharge line from the exhaust pipe, a short distance downstream from the exhaust pipe connection. The other sensor is mounted in the cylinder head manifold casting near the thermostat housing at a position just above the air compressor, as shown in Figure 15.

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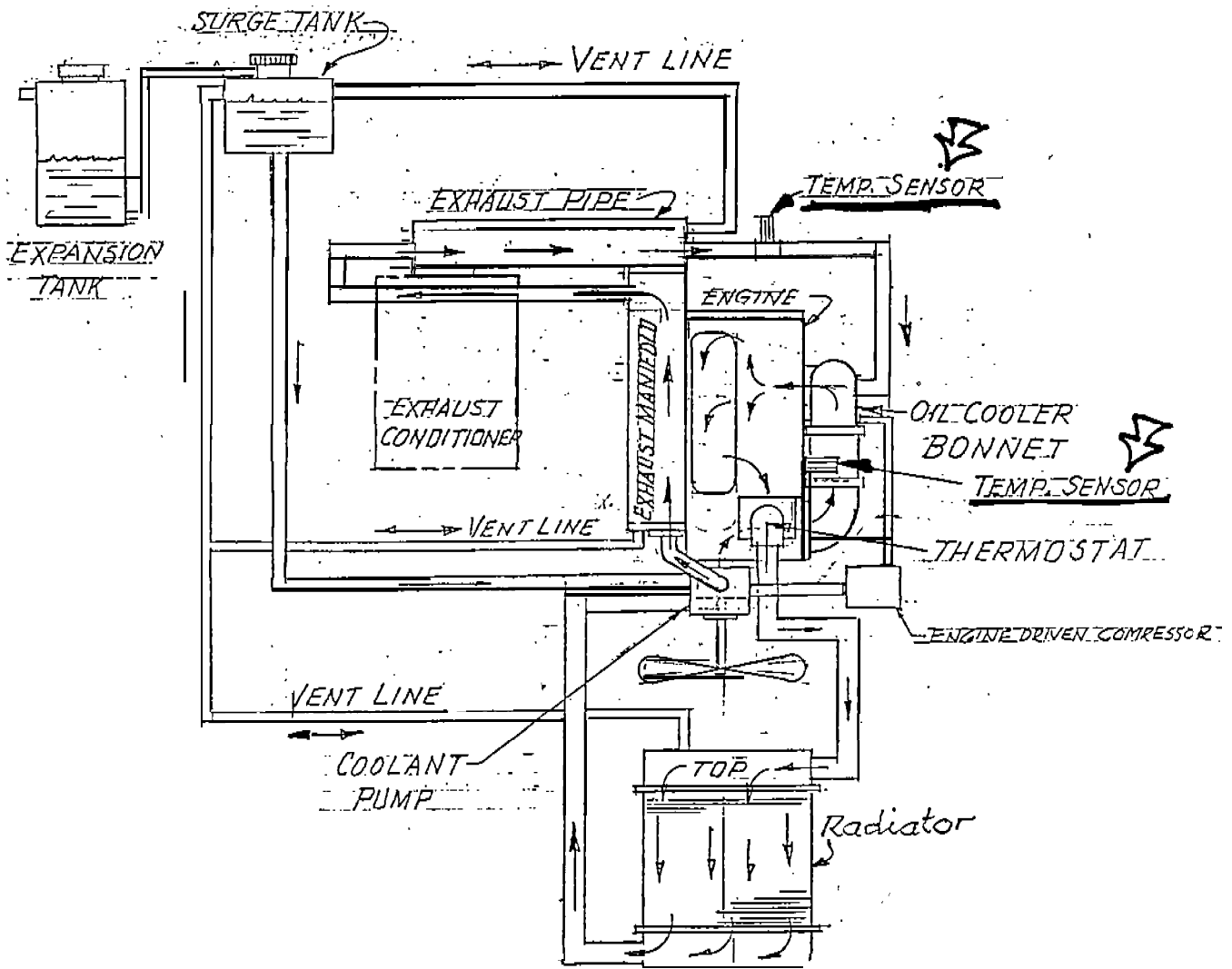


Figure 15. Coolant Temperature Sensor Locations.

Test the temperature sensor valves. Two test methods are offered for information. Either method is acceptable.

#### METHOD 1:

Unscrew the sensor valve and install a pipe plug in its place. Reattach the safety system air hose to the sensor. Start the engine and immerse the end of the temperature sensor valve into heated and agitated water/antifreeze mixture. The sensor must open and exhaust the safety system air pressure and shutdown the engine before the temperature exceeds 212 degrees F.

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## METHOD 2:

- a. With engine idling, slowly remove sensor hose venting safety system air pressure. This must cause the engine to shutdown.
  - b. Remove sensor and attach to low pressure shop air and test as in Method 1 above. Sensor must vent air before temperature exceeds 212 degrees F.
28. ( ) Engine mounted sensor shuts engine down before temperature exceeds 212 degrees F.
29. ( ) Exhaust pipe water outlet sensor shuts engine down before temperature exceeds 212 degrees F.
30. ( ) The temperature sensors are reinstalled and safety system air hoses are securely attached.
- (WEEKLY) 31. ( ) The Low Water Shut-down Valve operates properly, shutting the engine down at Exhaust Conditioner low water level.

To check for proper low water shut-down function, use the Test Port shown in Figure 16. The center of this port is located 8-21/32 inches above the outside bottom of the Exhaust Conditioner.

Close the valve in the water supply line between the make-up tank and the exhaust conditioner. Operate the engine at medium speed. Remove the Drain Plug from the Exhaust Conditioner.

**CAUTION: EXHAUST CONDITIONER WATER MAY BE HOT!**

After the engine has shut down, immediately replace the Drain Plug. Open the Low Water Test Port. The water level in the Exhaust Conditioner must not be below the bottom of the Low Water Test Port.

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(WEEKLY) 32. ( ) Replace the Low Water Test Plug.

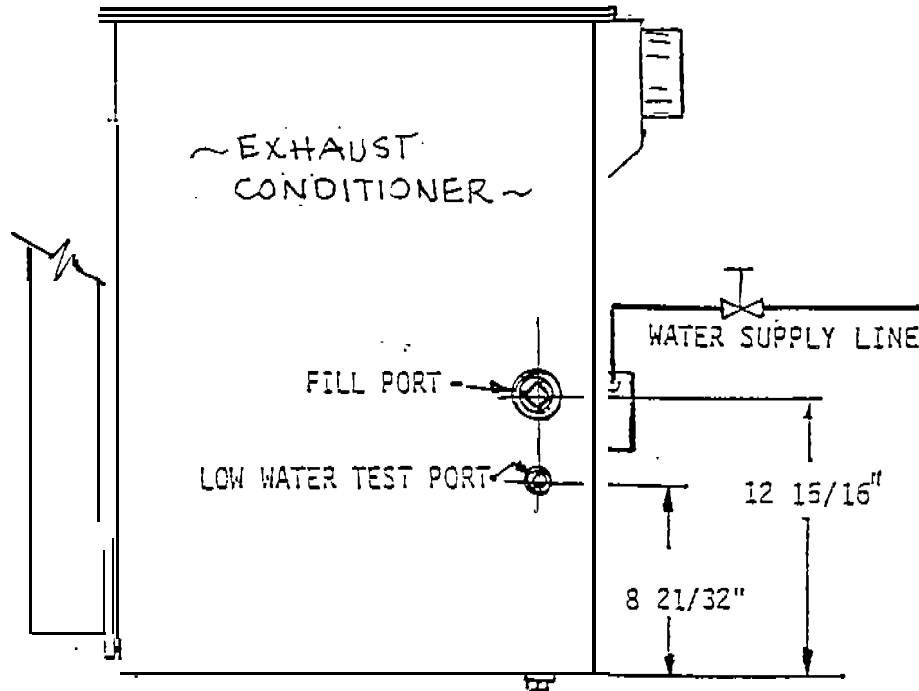


Figure 16. Location of Low Water Test& Fill Ports,

- (WEEKLY) 33. ( ) After the engine has automatically shut down due to exhaust conditioner low water level, try restarting the engine prior to replenishing the exhaust conditioner water. The engine may turn over but must not start.
- (WEEKLY) 34. ( ) Without refueling the exhaust conditioner, start the engine, operate at high idle and engage the emergency intake air shut-off valve. The air shut-off closes immediately and shuts down the engine. To accomplish this test, it is necessary to have a helper keep the float in the exhaust conditioner in its upper most position (with exhaust cover off) for the endurance of the test.
- (WEEKLY) 35. ( ) Reset the emergency intake air shut-off valve at the valve proper.

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- (WEEKLY) 36      ( ) Replenish the exhaust conditioner water through the fill port located 12-15/16 inches above the outside bottom of the conditioner tank, as shown in Figure 16.
- (WEEKLY) 37.      ( ) Open the make-up water supply valve.

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